



Potato Progress

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Advances in Potato Nematode Management

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Nematodes are microscopic, wormlike animals that inhabit soils and often attack plant roots and tubers. Potato plants can be parasitized and severely damaged by several nematode species. Damage from any of these potato nematodes can result in not only yield losses but in inferior quality tubers. Nematode infections, if not dealt with properly, can remain in a field for several years and reduce yields in a variety of crops. The most common potato nematodes in the Pacific Northwest are the root-knot nematode, lesion nematode, and the stubby root nematode. The root-knot nematode can dramatically reduce the viability and the quality of the potato plant and tubers. Root-knot nematodes feed inside the tubers themselves and form galls at feeding sites. The galls turn a normally smooth potato surface into a bumpy wart-like or rash covered surface. Root-knot nematodes can occupy the soil layer below the 24 inch mark and controlling this pest below this level is critical. The lesion nematode, which is less obvious than the root-knot nematode, can reduce overall yield. Lesion nematode infections weaken and increase stress to potato plants thus making them more susceptible to fungal, mostly *Verticillium* wilt, and bacterial infections. The stubby root nematode can cause stunted root systems which can increase the stress to a plant while decreasing the water and nutrient uptake. However, the nematode itself is not the major concern when it comes to this infection. Stubby root nematodes are a viable vector or transmitter of the tobacco rattle virus which is the pathogen that causes corky ring spot disease. Corky ring spot disease presents in the form of concentric rings of brown decaying tissue on the surface of the tubers. These rings can eventually move into the interior of the tuber causing the tubers to rot as well as tuber deformation and an overall reduction in quality. Once a field has an established potato nematode population eradication is impossible, one can only reduce the population density.

With the loss of Temik in 2011, the Vydate factory disaster in 2014, and the most recent reduction in application rates with Telone II, nematode management options have become increasingly limited. Management can become even more limited when nematode populations are too high for full label rates of Telone II and Vydate to be effective. The University of Idaho Nematology Program has been researching the effectiveness of several new potato nematicides and has determined that the following recommendations can be effective in reducing the yield loss and tuber damage if applied properly.

1. Green manure crops planted in the fall
2. Vapam (metam sodium) in the fall or in the spring at full label rate
3. Mocap 6 EC in the fall or the spring as a pre-plant incorporate
4. A combination of 1,2 and/or 3

5. Applications of Velum Prime or Vydate in combination with Vapam or fumigation or broadcast Telone II in the fall
6. Applications of Velum Prime in combination with a Movento or Vydate program

Green Manure Crops

Green manures, or biofumigation, are a highly under-utilized resource for potato growers. Once incorporated into the soil green manures release the natural fumigant methyl isothiocyanate or MITC. Green manure crops can also have a helpful monetary value as the major green manure crops are mainly oil radishes and some varieties of mustard. It is recommended that the green manure crop be grown for at least six weeks in the fall before being cut. As an extra measure they also recommend that cut green manure crop is incorporated into the infected field as more of the chemical can be released as the crop decomposes over the fall and winter.

Vapam (Metam Sodium)

Vapam is a contact nematicide that can be pre-plant shanked (broadcast fashion) into the soil in the fall or in the spring and must be in the soil at least two weeks before planting. Following Vapam with Velum Prime and/or Movento has increased nematode control in research trials conducted along the Snake River Plain. If Telone II is available instead of Vapam, this combination method could be effective and is being considered further at the University level. It should be noted that Vapam is quickly taken up by organic matter and efficacy of this product can be greatly reduced in soils with a high organic content, such as fields that have green manure incorporation.

Mocap 6 EC

Mocap is another contact nematicide. Research has shown that at the rate of 2 gallons per acre applied in the fall OR the spring, as a pre-plant incorporation, it can be effective in reducing overall nematode populations. This product can be used in conjunction with green manure crop incorporation.

Combination 1, 2 and 3

Combining effective methods of nematode control can further increase the overall efficacy of nematode management program. It is recommended that green manure is planted shortly after the fall harvest, allowed to grow for approximately 6 to 8 weeks before incorporation, Mocap 6 EC should be applied and incorporated. If incorporating green manure crops into the soil is chosen the use of Vapam or Telone II is not recommended because of their affinity to organic matter.

Velum Prime

Velum Prime is a new product produced by Bayer CropScience with the active ingredient fluopyram and has recently received EPA registration as a nematicide in potatoes. This product is not intended to be a fumigation replacement but will be most effective when used as a part of a normal nematode (root-knot and lesion) management program. The effectiveness of Velum Prime against stubby root nematode and the tobacco rattle virus is currently being studied. Two applications at 6.5 oz/a are currently allowed per growing season. The first application should be made as soon as possible and is usually chemigated in 0.5-0.75 inches of water during the first irrigation. The second application should be made at row closure or shortly thereafter. A soil penetrant may be used to facilitate movement deeper into the soil profile. Subsequent applications of other nematicides such as Movento can further augment a nematode management program. Velum Prime is not only a nematicide but can also suppress the incidence and severity of certain stem and foliar plant diseases like white mold and early blight.

Movento

Movento, another Bayer CropScience product, with the active ingredient spirotetramat, is another effective cog in nematode management programs and systems. Like Velum Prime, Movento is not a stand-alone nematicide and is intended to be incorporated into a nematode management program. Movento can be applied anytime during the growing season when there is sufficient plant foliage for uptake of the active ingredients, usually just prior to row-closure. A penetrating surfactant like MSO should be used when using Movento. Unlike metam sodium, Mocap 6 EC, and Velum Prime, Movento can be applied by air or ground and should not be watered into the soil as maximum uptake is facilitated by the foliage. Movento is currently being researched against stubby root nematode and the transmission of tobacco rattle virus as well. Efficacy of Movento has been compared to foliar applications of Vydate on root-knot and lesion nematodes.

Telone II

Telone II (1,3-D) is in short supply due to a number of production issues. In an attempt to treat more acres, a lower rate of 11 gal/a applied broadcast combined with other management tools when taking into account nematode population densities can be a viable option for nematode management in a potato crop. There are factors that a grower will need to consider to determine the use rate within the proposed labeled rate range for their nematode management program as well as which management tools to incorporate into a management program such as: Vydate applications, Velum Prime applications, and/or Movento applications. The addition of green manure crops to a Telone II program is not encouraged because of the high organic matter density the green manure provides.

Vydate

Vydate is a non-fumigant nematicide that can be useful in a potato nematode management program, but with a limited supply multiple chemigation applications are extremely limited to quantity obtained by growers. If Vydate is available a grower can apply 4.2 pt/a in-furrow at planting with subsequent chemigation applications of 2.1 pt/a starting around the 6 inch rosette stage, 45 days after planting then again at row-closure and every two weeks after that for no more than 5-6 applications depending on nematode populations and types. Early applications of Vydate can be replaced by applications of Velum Prime and late applications can be replaced by applications of Movento.

Each individual potato grower must consider their nematode management options and determine what the best route is for their field and what they are trying to achieve. Determination of field requirements and goals can be difficult when it comes to nematode infection. Diagnosis and recommendations can be facilitated by the University of Idaho Nematology Program located in Parma, Idaho. At least 500 cc (roughly 2 cups) of soil should be collected from various locations or suspicious looking spots throughout the field. Soil should be kept moist and cool during transport and shipped shortly after sampling. Roots or tubers can be included for further diagnosis if requested by the grower for an additional fee.

Nematode management programs are currently seeing a variety of limitations. However, new products and effective integrated management systems are now available.



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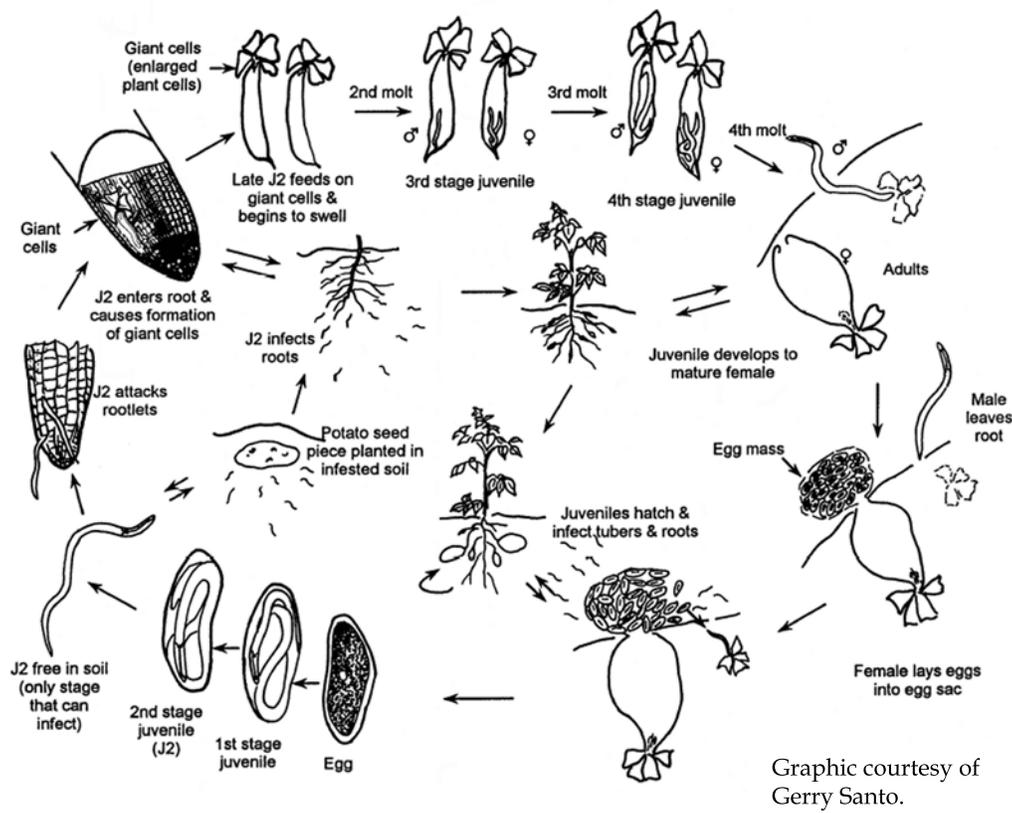
Root-Knot Nematodes

See also: <http://www.nwpotatoresearch.com>



(509) 765-8845

Root-knot nematodes have a complex life cycle.



Graphic courtesy of Gerry Santo.

General Information

Nematode species: *Meloidogyne chitwoodi* (Columbia root-knot nematode),
Meloidogyne hapla (northern root-knot nematode)

Biology: These plant-parasitic nematodes have complex life cycles (see above) involving a mobile stage that invades plant roots and tubers, and sedentary stages embedded in plant tissue. Root-knot nematodes overwinter easily throughout the Northwest. Most live in the top two feet of soil, but sometimes they are found up to 6 feet deep.

Distribution: Both northern- and Columbia root-knot nematode are widely distributed across the western states of the U.S. In the Northwest, Columbia root-knot nematode is most prevalent and damaging.



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